Installation Instructions

MicroLogix™ Analog Input Module

(Catalog Number 1762-IF4)

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Publication 1762-IN012A-EN-P

For More Information

For	Refer to this Document	Pub. No.
An overview of the MicroLogix 1200 system, including information on controllers and expansion I/O.	MicroLogix™ 1200 System Overview	1762-SO001A-US-P
Information on installing, wiring, and operating a MicroLogix 1200 Programmable Controller	MicroLogix 1200 Programmable Controllers User Manual	1762-UM001B-US-P
Installation guide for the MicroLogix 1200 Programmable Controller.	MicroLogix 1200 Programmable Controllers Installation Instructions	1762-IN006C-MU-P
More information on proper wiring and grounding techniques.	Industrial Automation Wiring and Grounding Guidelines	1770-4.1

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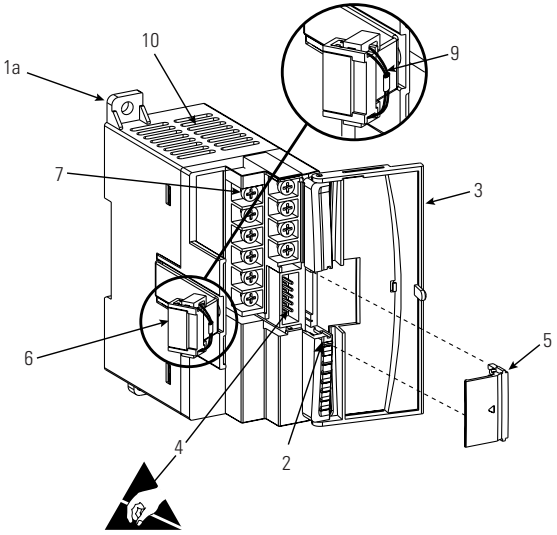
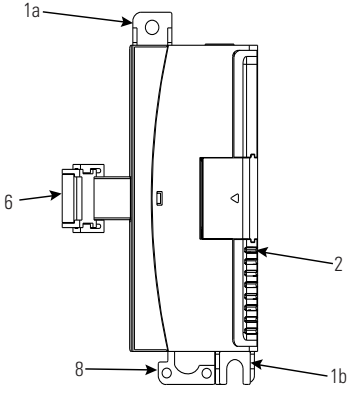
Description





Item	Description
1a	upper panel mounting tab
1b	lower panel mounting tab
2	power diagnostic LED
3	module door with terminal identification label
4	bus connector with male pins
5	bus connector cover
6	flat ribbon cable with bus connector (female)
7	terminal block
8	DIN rail latch
9	pull loop
10	input type selector switch

Installation

1762 I/O is suitable for use in an industrial environment when installed in accordance with these instructions. Specifically, this equipment is intended for use in clean, dry environments (Pollution degree 2[1]) and to circuits not exceeding Over Voltage Category II[2] (IEC 60664-1).[3]

Prevent Electrostatic Discharge

ATTENTION

Electrostatic discharge can damage integrated circuits or semiconductors if you touch bus connector pins. Follow these guidelines when you handle the module:

- Touch a grounded object to discharge static potential.
- Wear an approved wrist-strap grounding device.
- Do not touch the bus connector or connector pins.
- Do not touch circuit components inside the module.
- If available, use a static-safe work station.
- When not in use, keep the module in its static-shield box.

(1) Pollution Degree 2 is an environment where, normally, only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation shall be expected.

(2) Over Voltage Category II is the load level section of the electrical distribution system. At this level transient voltages are controlled and do not exceed the impulse voltage capability of the product's insulation.

(3) Pollution Degree 2 and Over Voltage Category II are International Electrotechnical Commission (IEC) designations.

Remove Power

ATTENTION

Remove power before removing or installing this module. When you remove or install a module with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices, causing unintended machine motion
- causing an explosion in a hazardous environment
- causing permanent damage to the module's circuitry

Electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance.

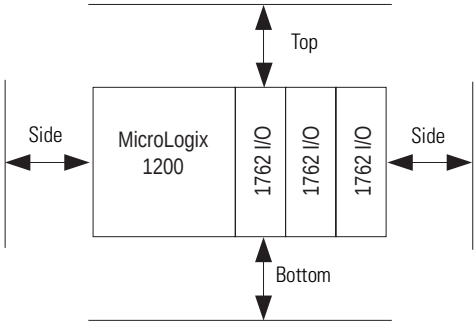
Mounting

ATTENTION

Do not remove protective debris strip until after the module and all other equipment near the module is mounted and wiring is complete. Once wiring is complete and the module is free of debris, carefully remove protective debris strip. Failure to remove strip before operating can cause overheating.

Minimum Spacing

Maintain spacing from enclosure walls, wireways, adjacent equipment, etc. Allow 50.8 mm (2 in.) of space on all sides for adequate ventilation, as shown:



NOTE 1762 expansion I/O may be mounted horizontally only.

ATTENTION

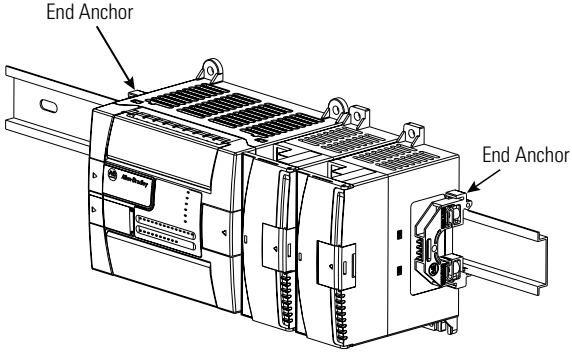
During panel or DIN rail mounting of all devices, be sure that all debris (metal chips, wire strands, etc.) is kept from falling into the module. Debris that falls into the module could cause damage when power is applied to the module.

DIN Rail Mounting

The module can be mounted using the following DIN rails: 35 x 7.5 mm (EN 50 022 - 35 x 7.5) or 35 x 15 mm (EN 50 022 - 35 x 15).

Before mounting the module on a DIN rail, close the DIN rail latch. Press the DIN rail mounting area of the module against the DIN rail. The latch will momentarily open and lock into place.

Use DIN rail end anchors (Allen-Bradley part number 1492-EA35 or 1492-EAH35) for environments with vibration or shock concerns.

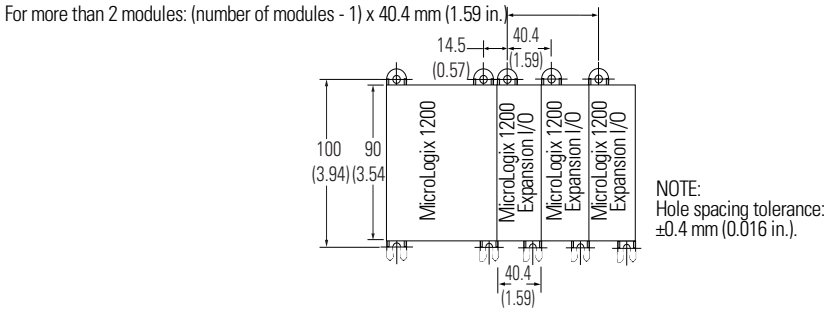


NOTE

For environments with extreme vibration and shock concerns, use the panel mounting method described below, instead of DIN rail mounting.

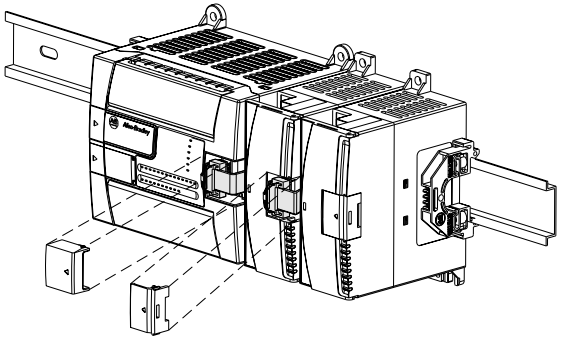
Panel Mounting

Use the dimensional template shown below to mount the module. The preferred mounting method is to use two M4 or #8 panhead screws per module. M3.5 or #6 panhead screws may also be used, but a washer may be needed to ensure a good mechanical contact. Mounting screws are required on every module.



System Assembly

The expansion I/O module is attached to the controller or another I/O module by means of a ribbon cable *after* mounting as shown below.



NOTE Use the pull loop on the connector to disconnect modules. Do not pull on the ribbon cable.

WARNING

EXPLOSION HAZARD

- In Class I, Division 2 applications, the bus connector must be fully seated and the bus connector cover must be snapped in place.
- In Class I, Division 2 applications, all modules must be mounted in direct contact with each other as shown on page 6. If DIN rail mounting is used, an end stop must be installed ahead of the controller and after the last 1762 I/O module.

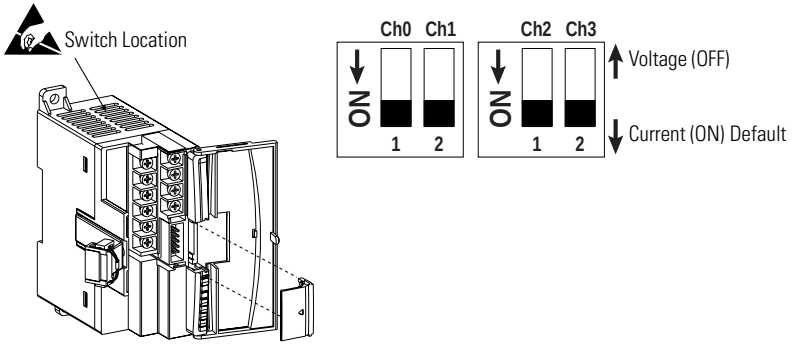
Field Wiring Connections

Grounding the Module

This product is intended to be mounted to a well-grounded mounting surface such as a metal panel. Additional grounding connections from the module's mounting tabs or DIN rail (if used) are not required unless the mounting surface cannot be grounded. Refer to *Industrial Automation Wiring and Grounding Guidelines*, Allen-Bradley publication 1770-4.1, for additional information.

Input Type Selection

Select the input type, current or voltage, using the switch located on the module's circuit board *and* the input type/range selection bits in the Configuration Data File (see page 15). You can access the switch through the ventilation slots on the top of the module. The factory default setting for all switches is Current. Switch positions are shown below.



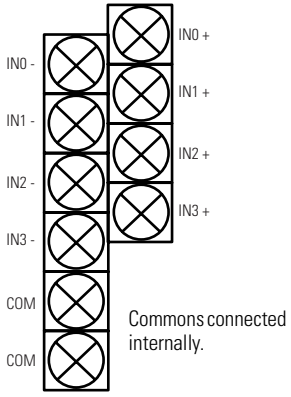
Wiring

System Wiring Guidelines

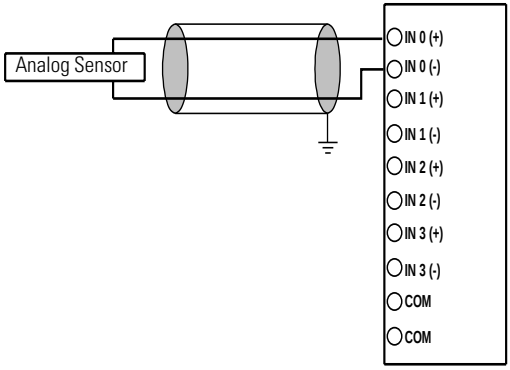
Consider the following when wiring your system:

- The analog common (COM) is not connected to earth ground inside the module. All terminals are electrically isolated from the system.
- Channels are not isolated from each other.
- Use Belden™ 8761, or equivalent, shielded wire.
- Under normal conditions, the drain wire (shield) should be connected to the metal mounting panel (earth ground). Keep the shield connection to earth ground as short as possible.
- To ensure optimum accuracy for voltage type inputs, limit overall cable impedance by keeping all analog cables as short as possible. Locate the I/O system as close to your voltage type sensors or actuators as possible.
- The 1762-IF4 module does not provide loop power for analog inputs. Use a power supply that matches the input transmitter specifications.

Terminal Block Layout

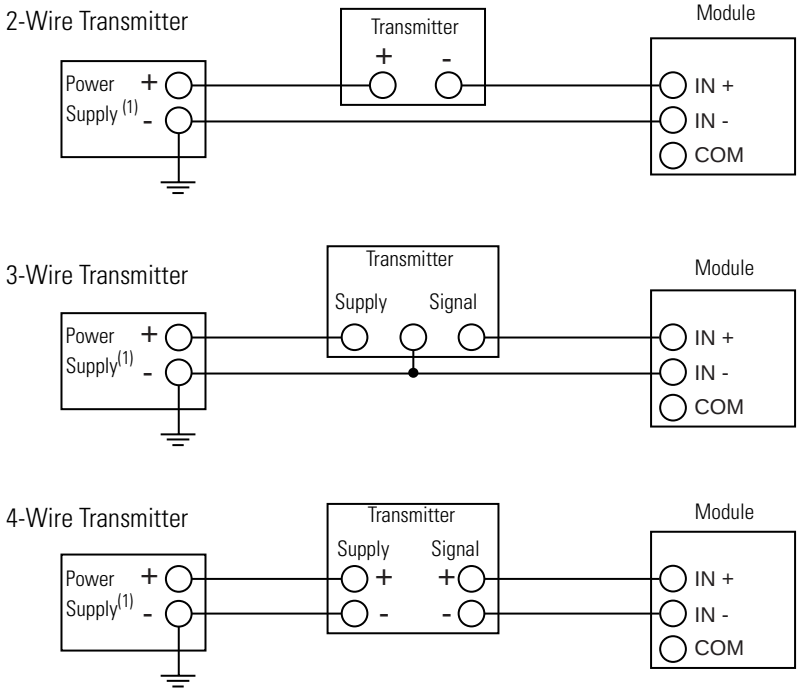


Differential Sensor Transmitter Types



NOTE Grounding the cable shield at the module end only usually provides sufficient noise immunity. However, for best cable shield performance, earth ground the shield at both ends, using a 0.01µF capacitor at one end to block AC power ground currents, if necessary.

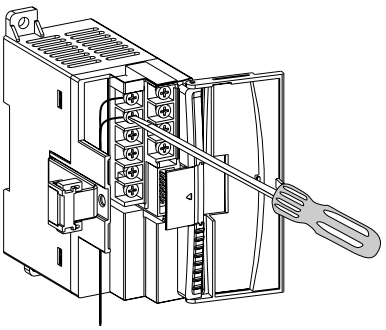
Sensor/Transmitter Types



(1) All power supplies rated N.E.C. Class 2.

Labeling the Terminals

A write-on label is provided with the module. Mark the identification of each terminal with permanent ink, and slide the label back into the door.



Wiring the Finger-Safe Terminal Block

ATTENTION

Be careful when stripping wires. Wire fragments that fall into a module could cause damage when power is applied. Once wiring is complete, ensure the module is free of all metal fragments.

When wiring the terminal block, keep the finger-safe cover in place.

1. Route the wire under the terminal pressure plate. You can use the stripped end of the wire or a spade lug. The terminals will accept a 6.35 mm (0.25 in.) spade lug.
2. Tighten the terminal screw making sure the pressure plate secures the wire. Recommended torque when tightening terminal screws is 0.904 Nm (8 in-lbs).
3. After wiring is complete, remove the debris shield.

NOTE

If you need to remove the finger-safe cover, insert a screw driver into one of the square wiring holes and gently pry the cover off. If you wire the terminal block with the finger-safe cover removed, you will not be able to put it back on the terminal block because the wires will be in the way.

Wire Size and Terminal Screw Torque

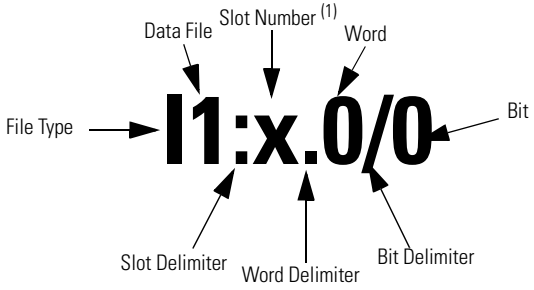
Each terminal accepts up to two wires with the following restrictions:

Wire Type		Wire Size	Terminal Screw Torque
Solid	Cu-90°C (194°F)	#14 to #22 AWG	0.904 Nm (8 in-lbs)
Stranded	Cu-90°C (194°F)	#16 to #22 AWG	0.904 Nm (8 in-lbs)

I/O Memory Mapping

Addressing

The addressing scheme for 1762 Expansion I/O is shown below.



(1) I/O located on the controller (embedded I/O) is slot 0. I/O added to the controller (expansion I/O) begins with slot 1.

Input Data File

For each module, slot x, words 0 through 3 contain the analog values of the inputs. The module can be configured to use either raw/proportional data or scaled-for-PID data. The input data file for either configuration is shown below.

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	SGN0	Channel 0 Data														
1	SGN1	Channel 1 Data														
2	SGN2	Channel 2 Data														
3	SGN3	Channel 3 Data														
4	reserved												S3	S2	S1	S0
5	U0	O0	U1	O1	U2	O2	U3	O3	reserved							
6	reserved															

The bits are defined as follows:

- Sx = General status bits for channels 0 through 3. This bit is set when an error (over- or under-range) exists for that channel, or there is a general module hardware error.
- Ox = Over-range flag bits for channels 0 through 3. These bits are set when the input signal is above the user-specified range. The module continues to convert data to the maximum full range value during an over-range condition. The bits reset when the over-range condition clears.
- Ux = Under-range flag bits for input channels 0 through 3. These bits are set when the input signal is below the user-specified range. The module continues to convert data to the maximum full range value during an under-range condition. The bits reset when the under-range condition clears.
- SGNx = The sign bit for channels 0 through 3.

Configuration Data File

The configuration of the format for analog inputs is made at going to run (GTR). Changes made to the configuration file while in run mode have no effect.

The configuration table is shown below.

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	reserved	Data Format Channel 0			Type/Range Select Channel 0				reserved				Filter Select Channel 0			
1		Data Format Channel 1			Type/Range Select Channel 1				reserved				Filter Select Channel 1			
2		Data Format Channel 2			Type/Range Select Channel 2				reserved				Filter Select Channel 2			
3		Data Format Channel 3			Type/Range Select Channel 3				reserved				Filter Select Channel 3			
4	reserved															
5	reserved															
6	reserved															
7	reserved															

Bit 15 and Bits 7 through 4 - Reserved

These bits are reserved and are not checked by the module.

Data Format (Bits 14 through 12)

These bits indicate the format of the data as shown in the following table. Other combinations of these bits are not supported and result in an error.

Bit Settings			Data Format
14	13	12	
0	0	0	Raw/Proportional
0	1	0	Scaled for PID
other			Not Supported

Type/Range Select (Bits 11 through 8)

These bits indicate the type and range as in the following table. Other combinations of these bits are not supported and result in an error.

Bit Settings				Data Format
11	10	9	8	
0	0	0	0	Voltage Mode -10 to +10V dc
0	0	1	1	Current Mode 4 to 20 mA
other				Not Supported

Filter Select (Bits 3 through 0)

These bits indicate the filter (for desired normal mode rejection) as shown in the table below. Other combinations of these bits are not supported and result in an error.

Bit Settings				Filter Frequency	4-Channel Conversion Time	Attenuation at Filter Frequency
3	2	1	0			
0	0	0	0	60 Hz	450 ms	>55dB
0	0	0	1	50 Hz	530 ms	>55dB
0	0	1	0	60 Hz	250 ms	>20dB
0	0	1	1	50 Hz	290 ms	>20dB
0	1	0	0	No filter	130 ms	—

Specifications

General Specifications

Specification	Value
Dimensions	90 mm (height) x 87 mm (depth) x 40 mm (width) height including mounting tabs is 110 mm 3.54 in. (height) x 3.43 in. (depth) x 1.58 in. (width) height including mounting tabs is 4.33 in.
Approximate Shipping Weight (with carton)	235g (0.521 lbs.)
Storage Temperature	-40°C to +85°C (-40°F to +185°F)
Operating Temperature	0°C to +55°C (+32°F to +131°F)
Operating Humidity	5% to 95% non-condensing
Operating Altitude	2000 meters (6561 feet)
Vibration	Operating: 10 to 500 Hz, 5G, 0.030 in. max. peak-to-peak
Shock	Operating: 30G
Bus Current Draw (max.)	40 mA at 5V dc 50 mA at 24V dc
Analog Normal Operating Range	Voltage: -10 to +10V dc Current: 4 to 20 mA
Full Scale(1) Analog Ranges	Voltage: -10.5 to +10.5V dc Current: -21 to +21 mA
Resolution	15 bits (bipolar)
Repeatability(2)	±0.1%
Input Group to System Isolation	30V ac/30V dc rated working voltage(3) (N.E.C. Class 2 required) (IEC Class 2 reinforced insulation) type test: 500V ac or 707V dc for 1 minute
Module Power LED	On: indicates power is applied.
Recommended Cable	Belden™ 8761 (shielded)

(1) The over- or under-range flag comes on when the normal operating range (over/under) is exceeded. The module continues to convert the analog input up to the maximum full scale range.

(2) Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.

(3) Rated working voltage is the maximum continuous voltage that can be applied at the terminals with respect to earth ground.

Specification	Value
Vendor I.D. Code	1
Product Type Code	10
Product Code	67
Agency Certification	C-UL certified (under CSA C22.2 No. 142) UL 508 listed CE compliant for all applicable directives
Hazardous Environment Class	Class I, Division 2, Hazardous Location, Groups A, B, C, D (UL 1604, C-UL under CSA C22.2 No. 213)
Radiated and Conducted Emissions	EN50081-2 Class A
Electrical /EMC:	*The module has passed testing at the following levels:*
ESD Immunity (IEC1000-4-2)	4 kV contact, 8 kV air, 4 kV indirect
Radiated Immunity (IEC1000-4-3)	10 V/m, 80 to 1000 MHz, 80% amplitude modulation, +900 MHz keyed carrier
Fast Transient Burst (IEC1000-4-4)	2 kV, 5 kHz
Surge Immunity (IEC1000-4-5)	1 kV galvanic gun
Conducted Immunity (IEC1000-4-6)	10V, 0.15 to 80 MHz(1)

(1) Conducted Immunity frequency range may be 150 kHz to 30 MHz if the Radiated Immunity frequency range is 30 MHz to 1000 MHz.

Input Specifications

Specification	Value
Number of Inputs	4 differential (bipolar)
A/D Converter Type	Successive approximation
Common Mode Voltage Range(1)	±27 V
Common Mode Rejection(2)	> 55 dB at 50 and 60 Hz
Non-linearity (in percent full scale)	±0.1%
Typical Overall Accuracy(3)	±0.3% full scale at 0 to 55°C ±0.24% full scale at 25°C
Input Impedance	Voltage Terminal: 200KΩ Current Terminal: 275Ω
Current Input Protection	±32 mA
Voltage Input Protection	±30 V
Channel Diagnostics	Over or under range or open circuit condition by bit reporting for analog inputs.

(1) For proper operation, both the plus and minus input terminals must be within ±27V of analog common.

(2) $V_{cm} = 1\ V_{pk\text{-}pk}$ AC

(3) $V_{cm} = 0$ (includes offset, gain, non-linearity and repeatability error terms)

Error Codes

The 1762-IF4 module notifies the controller of critical and non-critical errors. The module condition array word 0 contains the error codes that are generated by the module, as shown below.

"Don't Care" Bits				Module Error			Extended Error Information								
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hex Digit 4				Hex Digit 3				Hex Digit 2				Hex Digit 1			

The table below describes the module error codes.

Error Type	Hex Equivalent(1)	Module Error Code	Extended Error Information Code	Error Description
		Binary	Binary	
No Error	X000	000	0 0000 0000	No error
General Common Hardware Error	X200	001	0 0000 0000	General hardware error; no additional information
	X201	001	0 0000 0001	Power-up reset state
Hardware-Specific Error	X300	001	1 0000 0000	Reserved
Configuration Error	X400	010	0 0000 0000	General configuration error; no additional information
	X401	010	0 0000 0001	Invalid range select (Channel 0)
	X402	010	0 0000 0010	Invalid range select (Channel 1)
	X403	010	0 0000 0011	Invalid range select (Channel 2)
	X404	010	0 0000 0100	Invalid range select (Channel 3)
	X405	010	0 0000 0101	Invalid filter select (Channel 0)
	X406	010	0 0000 0110	Invalid filter select (Channel 1)
	X407	010	0 0000 0111	Invalid filter select (Channel 2)
	X408	010	0 0000 1000	Invalid filter select (Channel 3)
	X409	010	0 0000 1001	Invalid format select (Channel 0)
	X40A	010	0 0000 1010	Invalid format select (Channel 1)
	X40B	010	0 0000 1011	Invalid format select (Channel 2)
	X40C	010	0 0000 1100	Invalid format select (Channel 3)

(1) X represents "Don't Care".

Hazardous Location Considerations

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only. The following WARNING statement applies to use in hazardous locations.

WARNING

EXPLOSION HAZARD

- Substitution of components may impair suitability for Class I, Division 2.
- Do not replace components or disconnect equipment unless power has been switched off.
- Do not connect or disconnect components unless power has been switched off.
- This product must be installed in an enclosure.
- In Class I, Division 2 applications, the bus connector must be fully seated and the bus connector cover must be snapped in place.
- In Class I, Division 2 applications, all modules must be mounted in direct contact with each other as shown on page 6. If DIN rail mounting is used, an end stop must be installed ahead of the controller and after the last 1762 I/O module.
- All wiring must comply with N.E.C. article 501-4(b).

Environnements dangereux

Cet équipement est conçu pour être utilisé dans des environnements de Classe 1, Division 2, Groupes A, B, C, D ou non dangereux. La mise en garde suivante s'applique à une utilisation dans des environnements dangereux.

MISE EN GARDE DANGER D'EXPLOSION

- La substitution de composants peut rendre cet équipement impropre à une utilisation en environnement de Classe 1, Division 2.
- Ne pas remplacer de composants ou déconnecter l'équipement sans s'être assuré que l'alimentation est coupée.
- Ne pas connecter ou déconnecter des composants sans s'être assuré que l'alimentation est coupée.
- Ce produit doit être installé dans une armoire.
- Pour les applications de Classe I, Division 2, le connecteur de bus doit être correctement installé et son couvercle enclenché.
- Pour les applications de Classe 1, Division 2, tous les modules doivent être installés en contact direct les uns avec les autres, comme indiqué page6. Si on utilise le montage sur rail DIN, une butée doit être placée à l'avant de l'automate et après la dernière unité d'E/S 1762.

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